

Number Sense

Grades 3-5

Day 3

Learning Progression: K-5 Operations and Algebraic Thinking

- Read the learning progression for the grade level assigned to you.
- Make note of how it is connected to number sense.

Modules are built on the strands

Mathematical Standards: Development and Progression												
Standards for Mathematical Practice												
Make sense of problems and persevere in solving them. Construct viable arguments and critique the reasoning of others. Use appropriate tools strategically. Look for and make use of structure.							Reason abstractly and quantitatively. Model with mathematics. Attend to precision. Look for and express regularity in repeated reasoning.					
	Pre K	K	1	2	3	4	5	6	7	8	HS	
2.1 Numbers and Operations	(A) Counting & Cardinality											
		(B) Number and Operations in Base Ten						(D) Ratios and Proportional Relationships			(F) Number and Quantity	
					(C) Number and Operations - Fractions			(E) The Number System				
2.2 Algebraic Concepts	(A) Operations and Algebraic Thinking						(B) Expressions and Equations			(D) Algebra		
										(C) Functions		
2.3 Geometry	(A) Geometry											
2.4 Measurement, Data and Probability	(A) Measurement and Data						(B) Statistics and Probability					



PA CORE STANDARDS CURRICULUM MAP

MATHEMATICS PK-12

Week	Grade PREK	Grade K	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
1	Module 1: Analyze, Sort, Classify, and Count up to 5	Module 1: Classify and Count Numbers to 10	Module 1: Addition and Subtraction of Numbers to 10 and Fluency	Module 1: Fluency of Sums and Differences to 20 and Word Problems to 100	Module 1: Multiplication and Division with Factors of 2, 3, 4, 5, and 10	Module 1: Place Value, Rounding, Fluency with Addition and Subtraction Algorithms of Whole Numbers	Module 1: Whole Number and Decimal Fraction Place Value to the One-Thousandths
2							
3							
4							
5							
6							
7		Module 2: Identify and Describe Shapes			Module 2: Problem Solving with Mass, Time, Capacity, Length and Money		Module 2: Multi-digit Whole Number and Decimal Fraction Operations
8							
9							
10	Module 2: Analyze, Compare, Create, and Compose Shapes	Module 3: Comparison with Length, Weight, and Numbers to 10	Module 2: Place Value, Comparison, Addition and Subtraction of Numbers to 20			Module 3: Multiplication and Division of up to a Four-Digit Number by a One-Digit Number using Place Value	Module 3: Addition and Subtraction of Fractions
11							
12							
13	Module 3: Count and Answer "How Many" Questions up to 10						
14							
15							
16							
17		Module 4: Number Pairs, Addition and Subtraction of Numbers to 10	Module 3: Ordering and Expressing Length Measurements as Numbers and Telling Time			Module 4: Addition and Subtraction of Angle Measurements of Planar Figures	Module 4: Multiplication and Division of Fractions and Decimal Fractions
18							
19							
20							
21							
22							
23	Module 4: Describe and Compare Length, Weight, and Capacity	Module 5: Numbers 10-20, Counting to 100 by 1 and 10					
24							
25							
26							
27							
28							
29							
30	Module 5: Write Numerals to 5, Addition and Subtraction Stories, Count to 20		Module 6: Place Value, Comparison, Addition and Subtraction of Numbers to 100				
31		Module 6: Analyze, Compare, Create, and Compose Shapes					
32							
33							
34							
35							
36							

Precursors to Fluency

- ▶ The sequence of number names, both starting at 1 and not starting at 1
- ▶ How to count a set, keeping track of the items they counted
- ▶ Understanding relationships of more, less , and same
- ▶ Skip counting starting from 1 and from other numbers
- ▶ Cardinality
- ▶ Conservation
- ▶ 1-to-1 correspondence
- ▶ **Making tens – link to understanding place value**
- ▶ **Subitizing**
- ▶ **Decomposing and composing numbers**
- ▶ **Understanding part-part-whole**
- ▶ **Number sense**

Mental Math- Math Talks

- Encourages students to build on number relationships to solve problems instead of memorized procedures
- Using number relationships helps students develop *efficient, flexible* strategies with *accuracy*
- Causes students to be efficient to avoid holding numerous quantities in their heads
- Strengthens students' understanding of place value

More or less than $\frac{1}{2}$

- Is the following numbers more or less than $\frac{1}{2}$?
How do you know?
 - $\frac{5}{8}$
 - $\frac{16}{31}$
 - $\frac{50}{99}$
 - What evidence would you look for?

Which is greater?

- Which is greater? How do you know?

$\frac{3}{6}$ and $\frac{7}{15}$

- What evidence would you be looking for that students have understanding?

Video: 8 x 25 Grade 3

- The class had shared strategies for solving 8×25 before the teacher introduced the array model. Why do you think this instructional decision was made? How did she link previous strategies to this array?
- Noel incorrectly refers to columns as rows in the array. The teacher does not correct her. Why do you think she chose to ignore this error?
- How does the teacher connect the students' additive thinking to multiplication?
- How does the array support student understanding of multiplication? The commutative property? The distributive property? The associative property?
- Is there any evidence that students were engaged in the Standards for Mathematical Practice?

Video: $150 \div 15$, $300 \div 15$ Grade 5

- How did this particular sequence of problems help students use number relationships to solve the problem?
- What student confusions and misunderstandings surfaces from the array model?
- How did the teacher navigate the discussion to build understanding about multiplication, division, and the array model?
- Is there any evidence that students were engaged in the Standards for Mathematical Practice?

Games to Develop Number Sense

Simplified Krypto

Fraction Tracks

Play each of the games. After you play each game, answer the following questions:

- What concept(s) is the focus of each game?
- What tools might students use to support to solve the problems?
- Discuss the strategies students might use. Might they reason with facts they know?? How might you promote the use of more efficient strategies?
- Is there any way to adapt these games for older students to play?

Game Expert

For the game assigned to your group, be prepared to discuss:

- Concept that is focus of game
- Strategies students might use
- Ways to determine if students are engaged in mathematics
- Questions you might ask students as they are playing the game

Overview of Number Talks

- Let's get the scoop straight from an expert
- Please take a few minutes to read the article “Number Talks Build Numerical Reasoning” by Sherry Parrish from TCM, October 2011

Essential Components

1. Classroom Environment and Community
2. Classroom Discussions
3. Teacher's Role
4. Role of Mental Math
5. Purposeful Computation Problems

How Can We Help Students with Facts? Number Talks!

- Ongoing practice and engagement with math facts tasks
- Hands-on activities and thoughtful discussions
- Conceptual understanding of operations
- Strategic thinking

How might you get started?

- Precursor to any of this is a classroom culture of collaborative learning as a community
- Need to have something of substance to talk about

How might you get started?

- Turn and Talk
 - a.k.a. Think-Pair-Share
- Wait time
- Make thinking public

Talk moves

- Revoicing or Repeating
- Reasoning or Pressing
 - Agreement or disagreement
- Adding on or “Say More”
- Synthesizing or Summarizing

Article Discussion

- **Read and discuss: “Fluency: Simply Fast and Accurate? I Think Not!” by NCTM Past President Linda M. Gojak**
- How do the ideas in the article resonate with your ideas?
- What is the same? What is different?
- What stood out for you?

Read and Discuss

- **Discuss: “Why Children Have Difficulties Mastering the Basic Number Combinations and how to Help Them.”** from TCM, August 2006
- What are some reasons why students have difficulty mastering basic combinations?
- What new ideas did you discuss in your group about the relationship between number sense and fluency after reading the article?



What is number sense?

- Take a few minutes to jot down a few thoughts about what number sense is. Fill in the **RIGHT** side of your sheet.

I think number sense is ...	But now I know it is . . .

Planning

Plan a number sense activity such as-

- A series of number talks/quick images
- A task focusing on one standard and one standard for math practice involving the use of visuals to develop/extend number sense.
 - Include a mental math activity and a game.



Final Evaluation